

REMARKS/ARGUMENTS

Claims 1-2 and 4-61 are pending.

Claims 1-2, 4-16, and 19-61 have been amended.

Claim 3 has been cancelled.

Claims 10-14 and 17-18 have been withdrawn.

Claim 1 comprises the limitations of claim 3. Support for further the amendments is found in the claims and specification (e.g., the sequence listing; pages 16-17 and 24-35), as originally filed.

No new matter is believed to have been added.

Applicants wish to thank the Examiner for indicating the allowable subject matter of claims 4-5, 8-9, and 36-39. Claims 4-5, 8-9, and 36-39 have been objected as being dependent from the rejected claims. However, claims 4-5 and 8-9 are independent claims. Claims 36-39 depend from independents claims 4 and 5. Thus, claims 4-5, 8-9, and 36-39 are allowable without additional amendments.

Claims 19-25, 28, 40-45, 48, 52-56 and 5 have been amended to correct the term “labelling” to the term “labeling”. Applicants request that the objection be withdrawn.

Claims 1-3, 6-7, 15-16, 19-35, and 40-61 are rejected under 35 U.S.C. 112, second paragraph.

Claim 1 has been amended to delete the phrase “derivatives thereof”.

In amended Claim 1, Z^7 has been replaced by Asp and B^{37} as defined in Table 1 represents Arg. X^{18} is selected from the amino acids Ala, Asn, Cys, Gln, Gly, His, He, Leu,

Met, Phe, Ser, Thr, Trp, Tyr and Val. X¹⁸ is selected independently of the other amino acids at the other positions of the sequence.

Claim 3 has been cancelled. Claim 1 comprises the limitation of claim 1 that omits the term "examples".

In Claim 40, the assembly is coupled to a labeling molecule or to nanoparticles. Thus, the labeling compound comprises the assembly and the labeling molecule (or the nanoparticles). The labeling compound can be used, for example, for *in vivo* or *in vitro* diagnostic (see page 16 of the present specification and the Examples on pages 24-35).

Thus, it is believed that the claims are definite. Applicants request that the rejection be withdrawn.

Claims 1-3, 6-7, 15-16, 19-35, and 40-61 are rejected under 35 USC 112, 1st paragraph, for lack of written description because, according to the Examiner, the specification fails to provide adequate description for the *genus* of Claims 1-3, 6, 7, 15, 16, 19-35 and 40-61. The rejection is traversed because:

(a) the peptide sequence (I) has 75 amino acids of which 31 amino acids are clearly identified;

(b) the amino acids are identified at the positions involved in the affinity for phospholipids, toxicity, thermodynamic stability and reversibility of their folding processes; and

(c) the claimed peptides solve the technical problem of the present invention, i.e., the peptides have improved affinity for phospholipids, toxicity, thermodynamic stability and reversibility of their folding processes.

The purpose of the written description requirement is to ensure that a patent application conveys to a person of skill in the art that the applicants had possession of the

claimed invention. *See, e.g., LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F3d 1336, 1345, 76 USPQ2d 1724, 1731 (Fed. Cir. 2005).

The present invention concerns peptides possessing improved affinity for phospholipids, toxicity, thermodynamic stability and reversibility of their folding processes when compared to prior art peptides such as the peptides disclosed in the article of Montaville et al, 2002, JBC, vol. 277, pages 24684-93 (previously submitted). *See* the present specification pages 1-4.

The peptide sequence of claim 1 folds up in space so as to adopt its tertiary conformation, which is the active form of the peptide. Amino acids 12, 15, 16, 17, 19, 20, 22, 50, 55, 57, 58, 59, 60 and 65 are directly or indirectly involved in the binding to lipids, i.e. they are involved either in the three-dimensional structure of the peptide so that it adopts its active conformation allowing recognition of a negatively charged lipid, or in the peptide recognition site. *See* the present specification pages 3-8.

The amino acids J are the surface amino acids of this peptide when it is in its folded and active conformation. These residues are arranged spatially such that they are partially or completely exposed to the solvent. The amino acids J are selected from all the natural amino acids and at least 50% of them are polar residues selected from Arg, Asn, Asp, Cys, Gln, Glu, Gly, His, Lys, Orn, Pro, Ser and Thr. *See* the present specification page 6.

The amino acids U are the core residues of the claimed peptide. In the folded and active conformation of the peptide, they are spatially arranged close to one another and are not exposed to the solvent. They constitute the hydrophobic core of the protein. The compact assembly of the atoms of these residues plays a predominant role in the stability of the peptide in its active conformation. *See* the present specification pages 6-7.

The function of the residue X¹⁸ is to maintain the structure of the Gly-X-Gly loop in the active form of the peptide, in particular where the residues Z⁵⁹ and Z⁶⁵ are Glu, to

modulate the hydrophobic and lipophilic nature of this loop, and to provide new specific interactions with phospholipids. This is the case, for example, of the residues Asn, Cys, Ser, Thr, Trp and Tyr. *See* the present specification page 7.

The residues Z⁵⁹ and Z⁶⁵ are advantageously lysine residues, the effect of which is to replace the calcium ion with the positively charged -NH₃⁺ group of the lysine and to improve the affinity of the peptide for a negatively charged membrane. *See* the present specification pages 7-8.

The peptide of the sequence (I), in its active form, comprises three sites for binding to a calcium ion where the calcium ion complexed with this site constitutes one of the ligands of a negatively charged phospholipid. The first of these sites, called principle site, involves residues 15, 18, 19 and 59 as calcium ligands. The second of these sites, called secondary site, involves residues 20 and 22 as calcium ligands. The third of these sites, which is a low-affinity secondary site, involves residues 57, 60 and 65 as calcium ligands. Thus, the residues involved overall in the binding to phospholipids are residues 12, 15, 16, 19, 20, 22, 50, 55, 57, 58, 69, 60 and 65. This list includes residues involved in calcium binding, the phospholipids being calcium ligands. *See* the present specification pages 8-11.

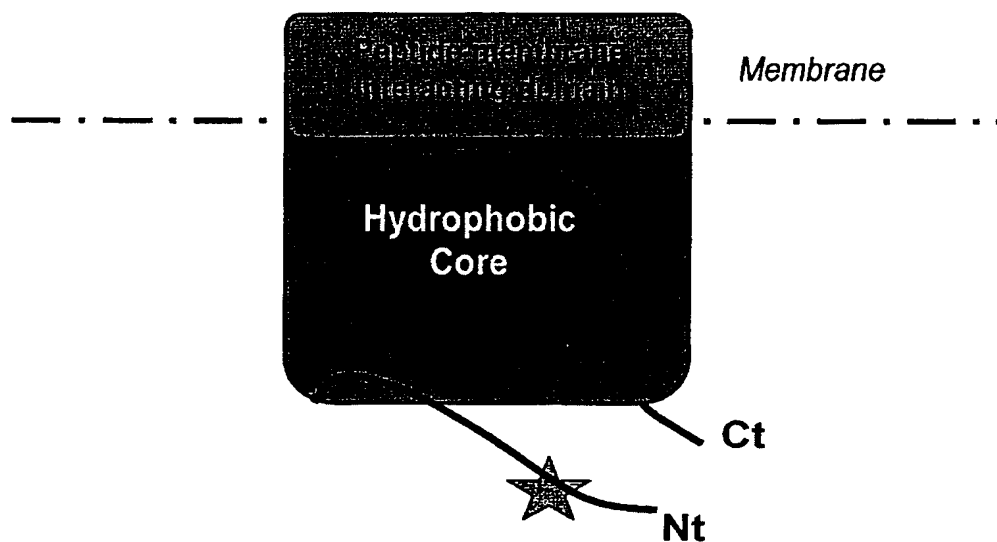
Because of the improved properties and the labeling, the claimed peptides are useful for detecting not only *in vitro* but also *in vivo*, e.g., apoptotic cells or foci and negatively charged lipids at the surface of the cells. *See* the present specification, pages 1-3, the Examples.

Claim 1 is directed to peptides comprising the sequence (I) with amino acids U and B as defined in Table 1 and the specific amino acids at positions 7, 14, 38, 62 and 75 as defined in the sequences SEQ ID No. 1 to 10 of the sequence listing.

Thus, the scope of the peptide sequence of Claim 1 has been restricted so that nearly 50% of the amino acids are clearly identified, e.g., the amino acids at positions 7, 8, 11, 12,

14, 15, 16, 17, 19, 20, 22, 25, 29, 31, 37, 38, 40, 44, 50, 52, 55, 56, 57, 58, 60, 62, 68, 72 and 75. These amino acids are which are important for the folding and/or activity. Thus, 29 amino acids are clearly identified while the sequence presents 75 amino acids. In addition, amino acids at positions 59 and 65 must be selected among the 4 following amino acids Glu, Asp, Lys and Arg.

The identified positions are fundamental in order to solve the technical problem of the present invention. The claimed peptide can be presents by the following diagrammatic structure:



As explained at pages 6 and 8 of the present specification, the domain directly or indirectly interacting with the membrane lipids comprises the residues 12, 15, 16, 17, 19, 20, 22, 50, 55, 57, 58, 59, 60 and 65. These residues affect the peptide affinity for lipids and are clearly identified in the peptide sequence of the Claim 1.

The stability and more generally the thermodynamic properties of the claimed peptide depend on the "hydrophobic core" domain the residues of which are the residues U and B listed in Table 1. To improve the properties in comparison with annexin, it is necessary to

select a suitable combination of hydrophobic residues, but the solution is not, however, unique and Table 1 includes combinations deemed best.

The lower part of the claimed peptide (see the drawing above) comprises, in particular, N-terminal and C-terminal segments to be used for various labels (for example, positioned at the star of the diagram) and/or grafting on various supports.

For surface residues of the claimed peptide according to the invention, other than those mentioned above, there is a certain freedom of choice. It should be noted however that some of these amino acids were set in the peptide sequence of the amended Claim 1 and on the basis of amino acids routinely found in the same position in SEQ ID NO. 1 to 14 of the appended sequence listing.

The peptide sequence (I) of Claim 1 has 75 amino acids of which 31 amino acids are clearly identified (i.e., nearly 50% of the amino acid sequence of the peptide are identified). The amino acids are identified at the positions involved in the affinity for phospholipids, toxicity, thermodynamic stability and reversibility of their folding processes.

It is therefore clear that the peptides comprising the peptide sequence as defined in Claim 1 can solve the technical problem of the present invention.

Thus, it is believed that the specification provides an adequate description for the genus of the claimed peptide.

Applicants request that the rejection be withdrawn.

The present application is a national stage of the PCT/FR03/02025 application, filed June 30, 2003, which claims priority to the applications FR 0208202, filed July 1/2002. A certified copy of FR 0208202 was submitted to the International Bureau in the PCT/FR03/02025 application. A Request for priority under 35 U.S.C. 119 and the

International Convention has been submitted with the present application. Applicants request that acknowledgement is made of a claim of priority.

Applicants have filed drawing with the application. However, the drawings have not been accepted or rejected. Applicants request that the Examiner indicates acceptance of the drawings.

Applicants request rejoinder of the method claims upon allowance of the claims directed to a product (e.g., peptide).

Applicants also request that upon allowance of generic claims, the Examiner considers additional species which depend upon the generic claims, i.e., peptides in combination with other peptides in claims 15-16; labeled peptides and peptides of claims 19-26; and a combination with filters in claims 35 (see the Restriction/Election requirement, pages 2-3).

A Notice of Allowance for all pending claims is requested.

Respectfully submitted,

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